I CLAIM:

1. A continuous flow reactor for conducting chemical reactions of one or more chemical reactants having an exothermic heat of reaction comprising:

a reactor shell having an inlet end sheet tube and an outlet end sheet tube;

the reactor shell having an internal reaction zone between said inlet and outlet end tube sheets;

at least one thermally conductive heat pipe extending between said inlet end and outlet end tube sheets and at least one end of said heat pipe extending through one of said tube sheets in fluid sealed manner to a position outside the reaction zone;

said reactor having a reactant inlet for introducing reactants to said reaction zone and a product outlet for conducting reaction products from said reaction zone;

a plurality of thermally conductive extended heat transfer surfaces mounted in conducting manner on the exterior surface of said at the thermally conductive heat pipe and extending into said reaction zone for receiving the heat of reaction from said reactants and conveying it to said at least one heat pipe;

said extended heat transfer surfaces defining therebetween channels for the flow said chemical reactants through said reaction zone; and

said at least one heat pipe having an evaporation section within the reaction zone and containing a liquid heat transfer fluid for absorbing the heat of reaction from said reactants by evaporating at substantially isothermal conditions to form a vaporized heat transfer fluid which is conveyed from said reaction zone.

2. The continuous flow reactor of Claim 1, wherein the heat pipe is a sealed heat pipe and the end of said heat pipe which extends through the tube sheet is a condenser adapted to absorb the heat of reaction from said vaporized heat transfer fluid.

3. The continuous flow reactor of Claim 1, wherein said at least one heat pipe is a thermosyphon heat pipe and said heat pipe has a first end which extends in fluid sealed manner through said outlet end tube sheet and said thermosyphon heat pipe has a second end which extends in fluid sealed manner through said inlet end tube sheet, said heat pipe first end is in fluid communication with a heat exchanger for conveying said vaporized heat transfer fluid to said heat exchanger and said heat pipe second end is in fluid communication with said heat exchanger for conveying condensed heat transfer fluid to said heat pipe.

4. The continuous flow reactor of Claim 1, wherein said at least one thermally conductive heat pipe is a principal heat pipe which is in fluid communication with a heat transfer device which is external to said reaction zone for removal of the heat of reaction from said continuous flow reactor, said thermally conductive extended heat transfer surfaces are fins and said fins have a plurality of sealed secondary heat pipes in thermally conductive contact therewith, said secondary heat pipes having a first closed end adjacent to said principal heat pipe and in thermal communication therewith and extending from said principal heat pipe to a second closed end which is remote from said principal heat pipe, said secondary heat pipes containing a liquid heat transfer fluid for absorbing the heat of reaction from said reactants by evaporating at substantially isothermal conditions to form a vaporized heat transfer fluid which can convey the absorbed heat of reaction to said principal heat pipe.

5. The continuous flow reactor of Claim 2, wherein said heat pipe which extends through said tube sheet is a principal heat pipe, said thermally conductive extended heat transfer surfaces are fins and said fins have a plurality of sealed secondary heat pipes said continuous flow reactor, said thermally conductive extended heat transfer surfaces are fins and said fins have a plurality of sealed secondary heat pipes in thermally conductive contact therewith, said secondary heat pipes having a first closed end adjacent to said principal heat pipe and in thermal communication therewith and extending from said principal heat pipe to a

second closed end which is remote from said principal heat pipe, said secondary heat pipes containing a liquid heat transfer fluid for absorbing the heat of reaction from said reactants by evaporating at substantially isothermal conditions to form a vaporized heat transfer fluid which can convey the absorbed heat of reaction to said principal heat pipe.

6. The continuous flow reactor of Claim 3, wherein said thermosyphon heat pipe is a principal heat pipe, said thermally conductive extended heat transfer surfaces are fins and said fins have a plurality of sealed secondary heat pipes in thermally conductive contact therewith, said secondary heat pipes having a first closed end adjacent to said principal heat pipe and in thermal communication therewith and extending from said principal heat pipe to a second closed end which is remote from said principal heat pipe, said secondary heat pipes containing a liquid heat transfer fluid for absorbing the heat of reaction from said reactants by evaporating at substantially isothermal conditions to form a vaporized heat transfer fluid which can convey the absorbed heat of reaction to said principal heat pipe.

7. The continuous flow reactor of Claim 1, wherein said at least one thermally conductive heat pipe is a principal heat pipe which is in fluid communication with a heat transfer device which is external to said reaction zone for removal of the heat of reaction from said continuous flow reactor, at least one of said plurality of thermally conductive extended heat transfer surfaces is comprised of a sealed flat heat pipe extending from said principal heat pipe into said reaction zone, said flat heat pipe contains a liquid heat transfer fluid for absorbing the heat of reaction from said reactants by evaporating at substantially isothermal conditions to form a vaporized heat transfer fluid which can convey the absorbed heat of reaction to said principal heat pipe.

8. The continuous flow reactor of Claim 2, wherein said heat pipe which extends through said tube sheet is a principal heat pipe, at least one of said plurality of thermally conductive extended heat transfer surfaces is comprised of a sealed flat heat pipe extending

from said principal heat pipe into said reaction zone, said flat heat pipe contains a liquid heat transfer fluid for absorbing the heat of reaction from said reactants by evaporating at substantially isothermal conditions to form a vaporized heat transfer fluid which can convey the absorbed heat of reaction to said principal heat pipe.

9. The continuous flow reactor of Claim 2, wherein said thermosyphon heat pipe is a principal heat pipe, at least one of said plurality of thermally conductive extended heat transfer surfaces is comprised of a sealed flat heat pipe extending from said principal heat pipe into said reaction zone, said flat heat pipe contains a liquid heat transfer fluid for absorbing the heat of reaction from said reactants by evaporating at substantially isothermal conditions to form a vaporized heat transfer fluid which can convey the absorbed heat of reaction to said principal heat pipe.

10. The continuous flow reactor of Claim 1, wherein said extended heat transfer surfaces are corrugated.

11. The continuous flow reactor of Claim 2, wherein said surfaces are corrugated.

12. The continuous flow reactor of Claim 3, wherein said extended heat transfer surfaces are corrugated.

13. The continuous flow reactor of Claim 10, wherein said corrugated fins are perforated to enable reactants fluid to pass through said perforations.

14. The continuous flow reactor of Claim 11, wherein said corrugated fins are perforated to enable reactants fluid to pass through said perforations.

15. The continuous flow reactor of Claim 12, wherein said corrugated fins are perforated to enable reactants fluid to pass through said perforations.

16. The continuous flow reactor of Claim 7, wherein said extended heat transfer surfaces are corrugated.

17. The continuous flow reactor of Claim 8, wherein said extended heat transfer surfaces are corrugated.

18. The continuous flow reactor of Claim 9, wherein said extended heat transfer surfaces are corrugated.